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Claims

1. A process for the polymerisation of ethylene ⁽⁵⁵⁾ or ethylene and at least one C₃₋₂₀ alpha olefin comonomer in the slurry or solution phase in a reactor having a polymer outlet stream, a procatalyst or catalyst feed stream and a hydrogen feed stream, said polymerisation being effected in the presence of a metallocene catalyst, a diluent and hydrogen, characterised in that said diluent is recycled from said outlet stream to said hydrogen feed stream, said procatalyst or catalyst feed stream is free of hydrogen, said hydrogen feed stream is free of procatalyst or catalyst and said procatalyst or catalyst feed stream does not comprise recycled diluent.
2. A process as claimed in claim 1 wherein the metallocene catalyst is fed to the reactor.
3. A process as claimed in claim 1 or 2 wherein said process takes place in the slurry phase.
4. A process as claimed in claim 1 to 3 wherein said diluent is propane, n-butane or isobutane.
5. A process as claimed in any one of claims 1 to 4 wherein said metallocene catalyst is supported.
6. A process as claimed in any one of claims 1 to 5 wherein said comonomer is butene, octene or hexene.
7. A process as claimed in any one of claims 1 to 6 further comprising a gas phase polymerisation stage subsequent to said slurry or solution polymerisation.
8. A process as claimed in any preceding claim wherein said metallocene catalyst is prepolymerised.

9. A process as claimed in any one of claims 1 to 8 wherein said catalyst feed stream comprises a catalyst feed vessel in which said metallocene catalyst is resident for at least 2 hours.

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10. A process as claimed in any preceding claim wherein prior to said process a Ziegler-Natta catalysed polymerisation is effected.

10 11. A process as claimed in claim 10 wherein the change from Ziegler-Natta to metallocene catalysis is effected continuously (i.e. without reactor shutdown) by stopping the feed of Ziegler-Natta catalyst feed and starting metallocene catalyst feed to the reactor.

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12. A process as claimed in any one of claims 1 to 11 wherein said metallocene catalyst comprises a compound of formula

20 $\text{Cp}'_2\text{MX}'_2$

wherein M is a group 3 to 10 transition metal;

each X' is halogen, diC_{1-6} -alkylamido, C_{1-6} alkyl, benzyl or hydrogen;

25 each Cp' is an unsubstituted cyclopentadienyl or indenyl group or a cyclopentadienyl or indenyl group substituted by one or more groups selected from C_{1-10} hydrocarbyl or siloxy, said Cp' groups being bridged or not bridged.

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13. A process for the polymerisation of ethylene or ethylene and at least one C_{3-20} alpha olefin comonomer in the slurry phase or solution phase in a polymerisation reactor comprising the steps of:

35 continuously introducing ethylene and optionally at least one C_{3-20} alpha olefin comonomer into said reactor; continuously introducing diluent into said reactor;